United Nations E/CN.17/2008/13/Add.7

Economic and Social Council

Distr.: General
10 January 2008

Original: English

Commission on Sustainable Development
Sixteenth session
5-16 May 2008
Item 3 of the provisional agenda*
Thematic cluster for the implementation cycle 2008-2009 — review session

Discussion papers submitted by major groups

Note by the Secretariat

Addendum

Contribution by business and industry**

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* E/CN.17/2008/1.

** The present paper was prepared by the International Agri-Food Network (IAFN) (www.agrifood.net). IAFN brings together international-level associations and federations whose members are suppliers of agricultural inputs and raw materials, individual and family farms, cooperative organizations, food processing and transport businesses, small and medium-sized enterprises through to multinational corporations. IAFN has sought input from the wider business community through networks such as the International Chamber of Commerce, the World Business Council for Sustainable Development and Business Action for Africa. This paper does not represent an official position or statement on behalf of IAFN or the other groups cited. The views and opinions expressed do not necessarily represent those of the United Nations.

07-66474 (E) 280108

I. Overview

1. Despite great success in raising agricultural productivity over the past half-century, world cereal stocks are at their lowest level in more than two decades. It is estimated that by the year 2030, the world population will have increased by about 1.5 billion people to reach some 8 billion people. In addition, rising incomes, especially in China and India, are driving the consumption of more meat, with associated higher resource requirements. This, combined with strengthening trends to use crops for non-food purposes, will further increase the imperative to raise agricultural productivity.

2. At the same time, pressure on natural resources — such as water, soil and biodiversity — is increasing dramatically. Extreme weather events are more frequent as a result of climate change, which is also the impetus to develop carbon-neutral fuels. To ensure environmental health and avoid further encroachment onto wildlife habitats, agriculture must balance multiplying demands and further increase the productivity of existing farmland by reducing losses and increasing yields through innovative agricultural techniques and good management practices. A globally sustainable system will comprise a mosaic of site-specific solutions that does not exclude a priori any option.

3. Agri-food businesses contribute to this objective by providing new innovations and supporting research on the best way to integrate them into the overall production system. The examples described in this paper give a taste of the many business initiatives worldwide, which, through lower prices, raise the quantity, quality and diversity of available food and safeguard the environment.

II. Introduction

4. Responding to the invitation to provide business and industry perspectives on the thematic areas of the sixteenth session of the Commission on Sustainable Development, this document identifies key issues and examples of successful implementation, ongoing barriers and obstacles, lessons learned and best practices emerging since the Commission focused on agriculture at its eighth session, in 2000.

5. Business and industry share the view that progress in this cluster is fundamentally important to achieving the Millennium Development Goals and to sustainable development. The urgency of challenges in agriculture and rural development is increased by the number of people who remain undernourished or malnourished and by continuing land degradation, drought and desertification; declining water supplies and soil fertility; and loss of biodiversity. Many of these are aggravated by climate change, particularly in Africa.

6. Social and economic dimensions must be addressed within an integrated, balanced and multi-stakeholder approach, based on sustainable development. It is in the interest of business and industry to work in partnership with Governments and other stakeholders to catalyse action to reduce hunger and poverty, to promote sustainable agriculture and rural development and to support sustainable management of land resources.

7. One of the first indicators of sustainable agriculture must be its ability to provide sufficient quantities of high-quality produce. In order to achieve this goal in

a way that ensures environmental health and profitability for farmers, agriculture and all stages of the agri-food chain must be as efficient as possible, using inputs optimally and minimizing waste.

8. While the Commission also reviews its decisions on water and sanitation taken at the thirteenth session of the Commission on Sustainable Development, business and industry reaffirms its view that improving basic access to water and sanitation is a crucial component of rural development. Integrated water resources management is essential to enhance agricultural productivity and sustainable management of land resources. In linking the review of the implementation of the thirteenth session of the Commission on Sustainable Development water and sanitation decisions to its thematic reviews at the sixteenth session of the Commission on Sustainable Development, the business and industry sector also refers delegations to its background papers for both the eighth session of the Commission on Sustainable Development and the thirteenth session of the Commission on Sustainable Development.[1]

9. Business and industry support and participate in the sustainable agriculture and rural development initiative that emerged from the eighth session of the Commission on Sustainable Development and was officially launched at the World Summit on Sustainable Development held in Johannesburg in 2002. They reaffirm their support for the overarching objective of sustainable agriculture and rural development to increase food production and enhance food security within a framework of sustainable natural resource management. It is important to build the capacity of poor rural communities to become aware of, and adopt, good practices that facilitate the transition to sustainable agriculture and rural development.

10. The Commission is encouraged to recognize and address the dramatically changing agricultural context — population and income growth, changing consumption patterns and market frameworks, rural-urban migration, climate change and other aspects of the declining availability of natural resources. It is imperative for all stakeholders to assume their responsibilities and take priority actions to raise agricultural efficiency and effectiveness.

III. Priorities and challenges

11. Since the eighth session of the Commission on Sustainable Development, which focused on agriculture and rural development, many examples of progress in social, economic and environmental terms have achieved improved soil management techniques and technologies to reduce erosion and pest impacts; the use of integrated farming techniques; the protection of biodiversity through sustainable intensification of land; the development of seeds with improved quality traits, higher yields or stress-tolerance; reduced waste of foodstuffs through judicious use of pest controls and improved storage and distribution systems; refined agro-forestry systems; improved water management and so on.

12. However, we are working towards a moving target. Climate change amplifies many issues, making it even more important for Governments, civil society and business to work together actively. The World Bank's *World Development Report 2008* asserts that agriculture is a fundamental instrument for sustainable

[1] www.un.org/esa/sustdev/documents/docs_sdissues_major_groups.htm.

development and poverty reduction. Business and industry welcome the conclusion that using agriculture as the basis for economic growth in the agriculture-based countries requires a productivity revolution in smallholder farming, and that to achieve this, the maintenance of agricultural resources is a global imperative.

A. Demographic trends are squeezing rural labour and agricultural land

13. Changing consumption patterns entail more diversified diets, including more fruits, vegetables and meat, all of which affect the use of natural resources such as water, nutrients and other inputs and accelerate the growth of agricultural demand.

14. The United Nations Population Division has calculated that 2007 marks the first time that more of humanity lives in urban areas than in rural areas. Migrants to cities — often people in their physical prime — are unavailable for rural labour, so farmers must become more effective. These factors are exacerbated by the impact of disease, especially in Africa, and the spread of cities onto fertile farmland.

B. Multiplying demands are being made on a finite resource base

15. What little additional arable land is available to bring under cultivation is often poorly served by existing infrastructure and markets, reducing short-term prospects for expanding farmland. Water supplies are subject to competing demands. Yet, in addition to the need for more food and more varied diets, there is growing interest in using agriculture for non-food purposes. According to recent figures from the United States Department of Agriculture and Food and Agriculture Organization of the United Nations, the global stock-to-use ratio of cereals is at the lowest point in more than two decades and equivalent to well under two months of consumption.

16. Increasing productivity on existing land is more favourable to the environment and less demanding on global resources than expanding into uncultivated areas. The integration of appropriate traditional methods and modern agricultural technologies along with site-specific best management practices allows farmers to increase production per unit area. Fragile ecosystems can thus be protected and natural habitats preserved.

C. Improved crops have long helped improve agricultural productivity

17. New crop varieties, whether developed through traditional breeding or through green biotechnology, help farmers to increase productivity on already ploughed land. In addition to enhancing crop yields or quality, breeding can also target specific attributes, such as producing canola with fewer transfatty acids or fibre crops with longer fibres.

18. Plant breeding primarily aims to produce vigorous plants that will fulfil their quality and yield potential. Such enhancements — coupled with other technological improvements — were demonstrated by the rice and wheat varieties that formed the basis of the green revolution. Their yields have increased 20-30 per cent on average since the 1970s. Similarly, studies released in 2002 by the Washington-based National Centre for Food and Agricultural Policy concluded that the widespread

adoption of six biotechnology-enhanced crops increased farmer income, boosted yields and spurred greater use of no-till agriculture.[2]

D. Pre- and post-harvest losses reduce agricultural output by about half

19. A significant challenge persists due to losses to pests and diseases which average around 35 per cent from pre-harvest pests and 10-20 per cent post-harvest. Losses in the developing countries of Africa, Asia and Latin America — precisely those areas where agriculture is the most crucial economic activity — are considerably higher than in industrialized countries and in some exceptional seasons even reach 100 per cent. It is now generally accepted that optimal pest management integrates a range of activities — from growing a healthy crop which is more able to withstand pest attack and creates conditions suitable for natural enemies, to the use of modern pest control chemicals and biotechnology.

E. A coordinated effort is needed to bridge the productivity gap sustainably

20. The required gains in productivity will require a coordinated approach across agricultural value chains — including retailers, marketing, manufacturing and processing, distribution, transport, crop protection, seeds, livestock, fertilizers, biofuels and industrial crops, forestry, etc. — and with farmers, Governments, non-governmental organizations and other stakeholders. The private sector is a major provider of technology and innovation throughout the agri-food chain and also strives to ensure that farmers have the information to optimize the output from their crops and livestock in the most environmentally and socially acceptable manner. However, the private sector alone does not have the resources to ensure universal uptake of the most sustainable practices for all sites. Governments need to support agricultural development through infrastructure development, research and development and appropriate regulatory frameworks, among others.

21. The sheer scale of agricultural production today has strained natural cycles. For example, of the 2 per cent of freshwater withdrawn for human uses, some 70 per cent is for agriculture. The weight of this sector's demand for freshwater is keenly felt, particularly in areas where local water supplies are already limited. It is imperative to improve the efficiency of water use in order to achieve more output per drop.

22. Nutrients also present challenges for managing scarcity and excess. The nutrient needs of crops outstrip the availability of organic materials in many places. Land degradation and desertification in Africa, for example, are intimately linked with the loss of massive quantities of soil nutrients. Micronutrient deficiencies have high costs in terms of both agricultural losses and human health and well-being. Such deficiencies are one of the major contributing factors to diseases and often have a detrimental impact on human development.

[2] www.ncfap.org/whatwedo/biotech-us.php.

23. Nutrients, especially nitrogen and phosphorus, are accumulating in other places. The fertilizer industry has joined the United Nations Environment Programme Global Programme of Action for the Protection of the Marine Environment from Land-based Activities and many other institutions in a global coalition to address this problem.

Box 1
Case study. Turning lost nutrients into feed grass

Livestock is a significant contributor to global greenhouse gas emissions, especially in New Zealand. A compound developed by Lincoln University scientists, when applied to urine patches in pastures, helps prevent the formation of these gases and nutrient leaching and holds potential for other temperate zones. Keeping nutrients in the soil improves pasture growth and provides an inexpensive form of additional feed. Commercialized by Ravensdown Fertiliser Co-operative Limited, the product is expected to dramatically reduce New Zealand's emissions while also reducing nitrate run-off into watercourses by between 30 per cent and 60 per cent. Many farmers have already adopted the technology, but some hesitate because it is not yet known whether farmers will get credit for being early adopters when the Government brings agriculture into its emissions trading scheme in 2013. This underscores the importance of a predictable regulatory framework (see www.ravensdown.co.nz/Products/Eco-n/Default.htm).

Box 2
Case study. Zinc fertilizer boosts yields and public health in Central Anatolia

Zinc deficiencies were identified in the early 1990s as reducing wheat yields in Central Anatolia (Turkey). Toros Agri Industry and Trade Company made zinc-enhanced compound fertilizers available to farmers at the same price as those containing just the three main plant nutrients. Convinced by the results in their fields, Turkish farmers significantly increased the use of the zinc-fortified fertilizer per year within a few short years, despite the repricing of the products to reflect the added-value of the zinc content. In addition to the agronomic benefits that have been evaluated at $100 million per year, this approach has also reduced zinc deficiencies in the local population. Zinc is essential for cell growth and division, fertility, a strong immune system and healthy eyes, skin, hair and nails. Almost half of the world's cereal crops are deficient in zinc and one third of the global population is at risk of lacking this key nutrient (see www.fertilizer.org/ifa/news/2007_13.asp).

F. Achieving optimal efficiency requires the right enabling market and policy frameworks

24. Infrastructure for transport and information, appropriate credit and insurance to reduce risk, reliable supplies of raw materials, functioning markets for both the inputs farmers need and the outputs they produce, as well as agricultural support networks (extension agents, crop advisors, etc.), are all important to foster agricultural development.

Box 3
Case study. Serving farmers by reducing credit risks for agrodealers

CNFA, a Washington-based non-profit that promotes public-private partnerships for development, established credit insurance in 2001 in Malawi to guarantee repayment of half of the money borrowed by agricultural input retailers to stock their shops. This greatly expanded the number of rural distributors and decreased the distances farmers travelled to obtain inputs, sometime quite dramatically, resulting in savings in both time and travel costs. By 2005, retailers covered by the guarantees earned more than $1 million (plus a significant amount not underwritten by the credit insurance). Their success boosted local economies, raised Government tax receipts and increased the provision of non-agricultural services.

After the 2005 food crisis, the Government distributed seeds and fertilizers in order to prevent the situation from worsening. The 2006 maize crop rebounded significantly, but the impact on private-sector retailers was devastating: commercial sales of fertilizers slumped by 60-70 per cent. A coalition engaged with the Government to transform the support programme into a private-public partnership. Retail sales have since recovered. CNFA recently received a major grant from the Alliance for Green Revolution in Africa (the coalition of the Rockefeller and Gates Foundations) to expand its credit guarantees in Kenya, Malawi and Tanzania (see www.cnfa.org).

25. The economic and trade policy context influences agriculture strongly. Structural adjustment programmes in the 1980s and 1990s led to underfunding and sometimes the collapse of Government extension services. The assumption was that the private sector would fill the gap, but the right policy environment — including appropriate and enforceable regulation, protection of intellectual property and carefully considered market interventions — was lacking. Moreover, this assumption overlooked the fact that both the private sector and the public sector have complementary roles to play.

26. Although it is imperative for the current round of World Trade Organization negotiations to create new market opportunities for farmers and rural entrepreneurs, the majority of farmers in developing countries, and especially those in Africa, who farm at a subsistence level, are currently unable to benefit from new trade

opportunities. One major contributing factor to this situation is the lack of access to appropriate inputs, information and an appropriate domestic policy framework.

IV. Agriculture, rural development, land: efficient and productive agriculture is the key driver of rural development and a critical lever for sustainable land management

27. Among low-income countries there is heavy reliance on the export of agricultural goods and primary commodities, which are generally subject (metals and minerals notwithstanding) to lower and more volatile prices than those of manufactured goods. Yet, in many developing regions, particularly in Africa, much agricultural production remains at the subsistence level, due to a lack of access to affordable inputs (including credit), technologies, information and markets.

28. In very poor areas, there is little excess production for international trade, even if farmers could transport their goods to market and produce them at levels of cost and quality to make them competitive in global markets. However, even in the poorest communities, agriculture drives economic and social development. Agricultural production therefore merits much greater support from the international community and national Governments as a primary means to alleviate poverty.

29. In a virtuous circle, broader economic development in turn supports the agricultural sector because it fosters demand for farmers' goods, as well as driving the development of infrastructure, stable policy frameworks, governance and institutions, among others, that all improve the functioning of agricultural markets and increase the efficiency of production systems.

30. The lack of appropriate tenure in many developing countries serves as a disincentive to maintain and improve agricultural land. The result is often pressure to overexploit land or to encroach on marginal and/or sensitive areas. However, land tenure is just one factor. Another important incentive is the appropriate valuation of ecosystem goods and services so that farmers are rewarded and not penalized for good management. In the absence of proper incentives, valuable ecosystem services such as biodiversity and water filtration may be threatened.

Box 4

Case study. Beating poverty with milk while linking rural and urban economies

With its high-quality milk, Nairobi-based Brookside Dairy has a 40 per cent share of the Kenyan dairy market. Seven per cent of its 80,000 suppliers are commercial farmers and the remainder are small-scale producers. The widespread lack of refrigeration facilities means that Brookside employs an army of delivery personnel, including more than 1,000 "bicycle boys" in the Nairobi area alone, to collect milk. Its sales depots now stretch from the East coast to the shores of Lake Victoria in the West.

Brookside's training field days, each attended by up to 6,000 local farmers, help spread best practices in livestock management and provide networking opportunities for smallholders, many of whom are geographically isolated. The business links rural and urban economies and offers a sustainable route out of poverty for many. Additional benefits to local communities are health education programmes and funding for school, church and road building projects.

Box 5

Case study. Providing incentives to source raw materials locally

SAB Miller, one of the world's largest brewing companies, sources local crops through guaranteed purchase agreements with thousands of subsistence farmers in Uganda and Zambia. To qualify for lower excise duties in Uganda, its subsidiary Nile Breweries began using the locally grown sorghum variety Epuripur, for its Eagle Lager. This highly successful public-private partnership increases farmers' incomes and provides an additional source of tax income by shifting consumption to legally sold beer. Eagle Lager achieved a 20 per cent market share in just four years. Nile Breweries plans to spend $1 million on sorghum — 60 per cent of which will go to the farmers, with the other 40 per cent spent on transport, procurement and processing (see www.sabmiller.com/sabmiller.com/en_gb/Our+responsibility/).

31. Market access and intelligence is critical for farmers, and new technologies, even in remote rural communities, are connecting farmers to timely market information and financial facilities as well as reducing transaction costs. The use of mobile phones and the Internet (even e-commerce and e-banking), represents leaps in efficiency, market access and profitability, while reducing waste, transport costs, etc.

Box 6

Case study. Kiosks for farmers

The Agricultural Information Network in Thailand, Agventures, in India, and Agri-Business Information System, in Jamaica, all aim to enhance the living standards of farmers by offering market prices, weather reports and farming best practices, which help improve labour productivity, increase yields and ensure better prices for produce.

To overcome low literacy rates and limited connectivity, some projects also provide "mediated access" through kiosks. For instance, through its e-Choupal kiosks, agri-exporter ITC Limited in India is building an internationally competitive agriculture business by empowering independent small farmers. EID Parry, an agricultural company in the Indian state of Tamil Nadu, has set up a network of "Parry's corners" through which farmers can access its India Agriline portal and e-commerce platform. The state of Karnataka is doing the same through its Raita Mitra Yojane project. The "Business intelligence

trade points" project in Burkina Faso provides access to market information through both national and regional centres. A similar hub-and-spoke system consisting of central and satellite agricultural information centres has been set up in Jamaica. In Bangladesh, a boat-based telecentre provides agricultural information to farmers located in areas inaccessible by roads.

Box 7

Case studies. Dial "A" for agricultural markets in Africa

The West Africa Agric Trade Network (www.tradenet.biz) provides information on the latest available prices from selected agricultural markets, buy and sell, news, contacts and other information required for commercial decision-making in all 15 member countries of the Economic Community of West African States. Farmers can receive all this information via text message on their mobile phones. The Trade in Hand project provides daily price information for fruit and vegetable exports in Burkina Faso and Mali, while Manobi, a Senegalese telecom company, provides agricultural and fish price updates to subscribers.

Safaricom, the Kenyan mobile phone operator, provides a text message service for farmers to access updates on commodities in markets direct from the Kenya agricultural commodity exchange. Traders can offer their goods for sale or place bids, as well as post short messages or questions on agricultural matters. Rural-based market information points help to extend the service to those farmers with limited access to mobile phones or computers.

32. Participatory approaches are required for long-term success in integrating traditional and local knowledge, new technologies, local inputs and appropriate infrastructure in order to achieve sustainable increases in productivity. In order to be more effective economic actors, it is useful for farmers, agri-input distributors and feed producers to organize into community groups that can negotiate more favourably for their members or even lobby policymakers for the right regulatory environment. Such groups may also dilute credit risks or obtain more affordable insurance.

Box 8
Case study. Sustainable agriculture and rural development initiative resource facility and online good practice database

The web-based sustainable agriculture and rural development initiative resource facility and online good practice database provides a vehicle for sharing the experiences of implementing communities and support groups, and communicating lessons learned to decision makers at higher levels. Facilitated by FAO Headquarters in Rome, the database offers stakeholders a way to record and share local good practices (see www.fao.org/SARD/en/init/2224/index.html).

Box 9
Case study. Landcare International

Landcare International is an association committed to the widespread application of a community-based approach that develops and applies innovative solutions to land management challenges, linking farmers with the broader community and helping them influence policy. Landholder groups initiate collective action to address land degradation and resource management issues, supported by Government programmes, such as AusAID, and the private sector, to back up local actions. Focusing on appropriate technologies, partnership development and institution-building, Landcare International has promoted similar initiatives in a growing number of countries, including Fiji, Germany, Iceland, Kenya, New Zealand, Philippines, South Africa, Sri Lanka, Uganda, United Republic of Tanzania and United States of America (see www.landcareinternational.net).

A. Technology, science and innovation are vital to achieve sustainable agriculture

33. Over the past 40 years, significant increases in productivity of the world's major crops — ranging from a 136 per cent increase in wheat yields (expressed as kilograms/hectare) to a 42 per cent increase in cassava yields — have more than kept pace with population growth. Productivity increases have been most dramatic in those regions of the world that have had access, and the opportunity, to adopt and adapt new technologies, integrating them with traditional methods that are suited to the particular conditions of a region. However, because land, labour and water are under pressure, it is critical to harness the human ingenuity expressed through improved management practice and innovative technologies. These include high-yielding crops adapted to difficult growing conditions (whether through traditional breeding methods or state-of-the-art techniques), crop protection products, improved crop nutrition and cutting-edge animal nutrition, among others. Stewardship and training are essential to fully realize the benefits of these technologies, and to

minimize any associated risks. For example, the plant science industry follows a life cycle, stewardship approach to managing its products — promoting good practices, from research and development, through field use, to disposal of any resulting waste, and working with Governments, non-governmental organizations and others to train farmers on the use and integration of appropriate technologies and inputs.

34. Computer-based information systems and precision tools are increasingly being adopted to operate farms more efficiently and to spare natural resources. For instance, the periodic occurrence of pests, plant diseases and weeds can be monitored and predicted. Weather models and accurate forecasts help to ensure that optimal use is made of natural resources, despite extreme weather events that can negatively affect the quality and yield of crops. This increases economic benefits for farmers and ensures yields of affordable and high-quality food and non-food crops.

35. Although precision farming is viewed by many as the reserve of big agribusiness operators, there are other, simpler precision methods that can be used by small-scale farmers too. One example is targeted pest-management through seed treatment. Treating seeds, rather than the whole field, reduces the amount of product applied by 95 per cent, targets only pests and safeguards beneficial insects in the vicinity. Another example is insect-resistant crops, which also spare beneficial insects. Both approaches save labour, water and fuel and have been used by small-scale farmers as well as on bigger farms. With regard to nutrient management, precision techniques have been adopted by thousands of farmers across Asia using the Leaf Colour Chart developed by the International Rice Research Institute. This chart employs the same principle as sophisticated chlorophyll meters employed by larger-scale farmers.

B. The critical role of integrated farming and ecosystems management

36. Because the most sustainable methods of production are site-specific, farmers should have the possibility to tailor their activities, drawing on a wide array of knowledge, experience and technologies. The integration of organic and mineral sources of plant nutrients, the adoption of suitable animal husbandry techniques, adapted plant varieties and integrated pest management systems are some of the components of the modern, knowledge-intensive approach to sustainable agriculture, which is often called integrated farming.

37. Sustainable farming approaches need to take account of local, site-specific conditions, varying climatic conditions and geography, access to markets, consumer demands and other factors. In general, it is a false choice to oppose modern techniques to traditional methods. Integrated farming systems that combine a mixture of both within site-specific good agricultural practices demonstrate the greatest potential to achieve productivity, efficiency and economy, while providing the social and environmental benefits sought by society. Specific challenges and priorities, such as soil fertility and water management, access to markets and lack of infrastructure and credit limit farmers' ability to choose the best practices. Therefore, Governments should invest in agriculture and provide the necessary market and policy frameworks to overcome these limitations so that agriculture can act as a catalyst for the development of other sectors of the economy.

38. Integrated management is now a fundamental component of both responsible crop production and livestock husbandry. The farm support industries and food

retailers[3] focus on working with farmers and other rural stakeholders to develop and disseminate technologies and farm management practices to ensure an integrated and holistic approach to farming. Within the framework of integrated crop management, the protection of natural habitats within the farm environment is recognized as a means of conserving biodiversity, including many natural enemies of pests. Techniques include field margins or field levees (in the case of rice), as well as beetles banks or hedges. These islands provide habitats, cover and refuges for beneficial insects and other animals, thus contributing to the goal of the Convention on Biological Diversity to establish a network of connecting corridors of wildlife habitats to ensure biodiversity conservation at a landscape level.

39. Options that fit into integrated pest management include biological, mechanical and chemical crop protection measures as well as insect-resistant crop varieties. Modern pest management is based on prevention, careful monitoring of crop health (pressure from disease, weed and pest populations) and expedient interventions. Natural control processes — such as crop rotation and encouraging beneficial pest predators — also help to avoid outbreaks. The crop protection industries are strongly committed to developing, promoting and implementing integrated pest management technologies and practices at all levels.

40. Integrated plant nutrition management, which enhances soil productivity through the balanced use of mineral fertilizers combined with organic sources of plant nutrients, is supported by FAO and the fertilizer industry. To replenish nutrients removed by crops, farmers should begin by recycling on-farm sources of nutrients and then correct any deficiencies by using fertilizers. Although the recycling of available organic material (plant and animal residues) is a desirable feature of all farming systems, helping to retain moisture and build soil structure, it is now recognized that recycling alone rarely provides adequate nutrients for sustained, productive cropping.

Box 10

Case study. Conservation tillage helps prevent soil erosion and water loss

Conservation tillage, where seeds are sown directly into the previous crop's stubble without any immediate tillage, protects land from wind and water erosion, and loss of ground moisture. It results in higher levels of soil organic matter, enhanced soil aeration, preservation of soil structure and soil fauna, as well as lower fuel/labour requirements. Conservation tillage is enabled by herbicides and has reduced erosion by up to 95 per cent in many areas. A typical example is a farm in the United States of America with increased levels of over 50 per cent in soil organic matter from 2.7 to 4.3 per cent, with some fields reaching 6 per cent (see www.fao.org/News/2000/000501-e.htm).

[3] www.globalgap.org.

41. Integrating ecosystem management approaches in mainstream agriculture will contribute to sustainable agriculture on a global scale. Rather than being based on arbitrary input reductions or on extensive production systems that require more land, this approach entails the development and application of practices tailored to the local situation and assessed by indicators of conservation and biodiversity enhancement as well as traditional measures of agricultural output. Market mechanisms, such as certification schemes developed by professionals, farmers, Government bodies and other stakeholders, provide an important incentive for farmer adoption. The idea is to turn a set of apparent constraints on farmers and the agri-food industry into a win-win, profitable situation.

Box 11
Case study. Developing measures to manage agro-ecosystems

As part of its wider efforts to enhance on-farm biodiversity, Bayer CropScience opened biodiversity centres in the company's research farms in the United Kingdom of Great Britain and Northern Ireland in 2007 in order to evaluate the impact of measures such as the establishment of beetle banks, hedgerows and ponds on farm biodiversity. What is learned is shared with farmers, distributors, agricultural consultants and the wider community to stimulate replication. In Brazil, the company restored farmland surrounding a lake: about 8,000 native tree species were planted, reducing soil erosion, stabilizing water flow and fostering the return of many native wildlife species. A manual developed during the pilot project gives directions on growing native plants. This encouraged scaling-up and has resulted in the planting of more than 100,000 native trees so far.

V. Drought, desertification and climate change

42. The World Bank *World Development Report 2008* notes that part of the falling crop production in sub-Saharan Africa could be attributable to climate change, an important risk factor for food production and development that is likely to have a disproportionate impact on farmers in developing countries. In some cases, it will exacerbate existing problems, such as water scarcity or irregular rainfall. In others, it will create new challenges, and there are many uncertainties, among them, how various crops, pests and diseases will adapt to new climatic conditions.

43. The potential impacts of climate change and the role of technologies to help communities adapt to its effects are particularly important in the context of sustainable agriculture. Agri-businesses are actively developing technologies to provide stress-tolerance to crops so they are better able to withstand extreme conditions. Examples include new varieties with greater drought and salt resistance that maintain yields while decreasing the need for irrigation. Specific genes have already been identified that allow plants to survive with less water. Increasing the ability of plants to withstand the stresses of high temperatures will improve yields in some regions, and increasing salinity tolerance in crops will allow land that has been stressed by climate change to be more productive.

Box 12
Case study. Breeding plants that resist the stresses associated with climate change

One impact of climate change is the growing frequency of extreme weather events, which substantially increases the vulnerability of global agriculture. Improved crops that can withstand increasingly tough conditions will help to ensure that agricultural productivity will continue to meet the demands placed upon it. Bayer CropScience is currently developing stress-tolerant plants that not only adapt to drought (as would drought-tolerant crops) but can also better cope with floods, heat, cold and salinity. Since stress tolerance pathways exist in all plants, it is expected that this enhancement will be applicable to a majority of crops, if not all.

44. Agricultural business and industry also support universities and public research institutes. Agri-business supports the World Bank recommendations to increase investment in agricultural research and development (public and private) and foster multi-sectoral approaches to capture the synergies of technology, particularly in sub-Saharan Africa.

45. Further development of long-range weather forecasting, insurance against crop failure and other disasters, flood prevention mechanisms and improved soil and water management techniques are examples of adaptation strategies that will benefit rural communities.

Box 13
Case study. Drought insurance programmes reduce farmer risk

An innovative programme launched in 2005 for groundnut farmers in Malawi helps farmers to obtain certified seeds, which produce increased yields and revenues as well as greater resistance to disease. The National Smallholder Farmers' Association of Malawi, in conjunction with the Insurance Association of Malawi and with technical assistance from the World Bank and Opportunity International Network, financed by the Swiss State Secretariat for Economic Affairs, designed the index-based weather insurance contract. If a drought leads to insufficient groundnut production, the bank pays the loans of insured farmers directly. If there is no drought, the farmers benefit from selling the higher-value production. This is the first time that such index-based weather insurance policies have been sold to smallholder farmers in Africa. A similar pilot in India in 2003 has been expanded to more than 250,000 farmers.

46. In addition to adaptation, progress is also being made to identify and implement mechanisms for rural communities to capitalize on the potential to mitigate and offset emissions by improving management of soil, water and forestry

resources, preventing deforestation, producing bioenergy and carrying out other socio-economic development options in rural areas.

Box 14
Case study. Linking emissions reductions in packaging and on-farm carbon sequestration

The United Kingdom subsidiary of the global packaging-products company Tetra Pak has been working hard to reduce its manufacturing emissions of greenhouse gases (by nearly 25 per cent between 2001 and 2005).

To supplement these efforts within the company and to offset its remaining emissions, it has been buying carbon credits from farmers in the Bushenyi district of Uganda who plant indigenous tree species and from biomass and solar energy projects in India and Sri Lanka. In the tree-planting project, the farmer is entitled to any ancillary benefits — for example, letting goats graze there and using pruned branches — as long as the trees themselves are not harmed. Payments are channelled through carbon broker Bioclimatic Research and Development and a Ugandan national conservation trust.

47. Improved soil management techniques, including conservation tillage, contour ploughing, direct drilling and under-cropping are being deployed to help address soil erosion, particularly in zones that are identified as most vulnerable to the direct impacts of climate change. Conservation tillage, made possible through the use of herbicides, protects land from soil erosion, increases soil organic matter and improves retention of soil moisture, thus protecting valuable water resources.

A. Deriving renewable raw materials from biomass for the production of energy and in the chemical sector has major implications for global agriculture

48. Driven by intensifying climate change discussions, concerns about security of energy supplies and by rising oil prices, the use of biomass for biofuels, energy production and in the chemical sector is growing. Targets set for biofuels in the United States (17 per cent by 2017) or in Europe (10 per cent by 2020) and for renewable energy production (20 per cent in Europe by 2020, mainly based on biomass use) are first political steps. But the use of wood and plant oils as fuels for electricity and heat production is already growing. In the chemical sector a significant part of raw materials in the production of organic chemicals is already bio-based. For example, in Europe, about 10 per cent of the feedstock for organic chemicals production consists of raw materials such as animal and vegetable oils, starch, cellulose, carbohydrates and others. The first large ethylene plants with bioethanol as the feedstock have been announced in Brazil.

49. It is still very unclear how much biomass is available for technical purposes. This is due to several factors, such as progress in agricultural techniques, climate

change, future consumption patterns and water availability as well as interactions with the imperative of supplying food and feed for a population of up to 9 billion people in 2050. Optimistic experts talk about covering 60 to 70 per cent of our future energy consumption; pessimists say 30 per cent. There is currently no surplus of biomass, and competition between its use for food/feed purposes and for technical purposes can already be felt and will intensify in the future. The major part of the biomass available for technical uses in future will come from the tropical countries in South America, Africa and South Asia; however, a large share of the consumption will occur in North America and in Europe.

50. Many social and environmental questions have to be addressed: difficulties of food and feed availability, especially for the developing countries, dramatically rising and increasingly volatile prices for food and feed, ecosystem damage (e.g., cutting down tropical rain forests), impacts on biodiversity, and so on. Certification systems and standards could at least partially address such issues, but the implementation of effective schemes is not a simple affair.

51. An integrated approach to the use of biomass is needed. Isolated targets in different regions for single uses would cause growing problems and intensify the competition problem. An analysis of the global availability of biomass is needed as the basis for an integrated worldwide strategy to optimize the technical use of limited sources of biomass.

Box 15
Case study. Syngenta partnership to develop biofuels

Syngenta and Diversa Corporation have a 10-year partnership to research and develop a range of new enzymes to convert pre-treated cellulosic biomass economically to mixed sugars, one of three key steps in biofuel production. A pilot project in the United Kingdom of Great Britain and Northern Ireland supplies high-yielding oil seed rape seeds to farmers who sell the crops for electricity generation (see www.syngenta.com/en/social_responsibility/agriculture_biofuels.aspx).

VI. Africa: a particular context

52. Accelerating the development of African agriculture is critical to the sustained growth of its economies and improving the lives of millions of poor people, particularly women, who depend directly upon agriculture for their livelihoods and food security. In sub-Saharan Africa, agriculture contributes at least 40 per cent of exports, 30 per cent of gross domestic product, up to 30 per cent of foreign exchange earnings and 70-80 per cent of employment. Business Action for Africa[4] members and other businesses that operate in Africa in the agri-food sector recognize the crucial role of agriculture and the need to address the following key issues.

[4] www.businessactionforafrica.org.

53. Effective risk management lies at the heart of achieving agriculture that is environmentally, socially and economically sustainable. There are many inherent risks in agriculture — such as unpredictable rainfall, depleted soils, pests, weeds, crop diseases and world commodity prices — and farmers in Africa face additional risks, including HIV/AIDS, malaria, political instability and unreliable infrastructure. Climate change will most likely increase these risks. Farmers need information, better access to markets and capital, secure income streams through long-term relationships with customers, appropriate technologies, farm inputs, diversified crop and animal portfolios, secure land tenure and adequate supplies of water and irrigation.

54. Connecting smallholder farmers with local markets and supply chains that link with national, regional and global economies is crucial for scaling up growth in the agricultural sector and improving the prospects and welfare of farmers. Building the capacity of farmers to meet the requirements of customers is vital so they can be successfully integrated into commercial supply chains. This means being able to meet product quality and environmental standards, and to get products to customers on time and in good condition, and may require significant investment in training, inputs, irrigation and infrastructure.

Box 16
Case study. Using supply chain partnerships to support agriculture in Africa

Unilever has been an active proponent of schemes to broaden the supply-base and support local livelihoods, particularly in its tea and palm-oil estates. Lipton/Unilever Tea has a partnership with Rainforest Alliance on sustainability certification. Other initiatives are being piloted to check the viability of the business-model: for example, growing herbs and spices in the Sauri Millennium Development village in Kenya which links into a wider engagement through Business Alliance Against Chronic Hunger.

A Unilever partnership with Tanzania Forest Conservation Group, Ministry of Natural Resources, World Agroforestry Centre and the World Conservation Union promotes Allanblackia seed production for fat/oil, as a substitute for palm oil in spreads, soap and as an alternative source of farmer income. Farmers, transporters and crushers benefit, and the value of Allanblackia trees encourages farmers to reverse deforestation (see www.unilever.com/ourvalues/environment-society/case-studies/agriculture/?linkid=navigation).

55. Effective farmer organizations are important support groups that can play a role in joint assurance, certification, training and purchasing agreements. These are particularly effective where linked to support programmes such as farmer field schools.

56. Local small and medium enterprises have an essential role to play in creating markets, supplying inputs, processing produce and providing employment for rural communities. Investment in research and rural institutions is needed to increase

opportunities and choice and to improve information on accessing markets, for example through mobile telephones.

57. Developing long-term, stable relationships with customers is vital to improve the security of farmers' incomes. Sustainable agriculture will not be achieved unless farmers have a realistic idea of the current and future levels of demand for their crops, the right incentives to invest in their farms over the long term and a diversified crop portfolio. Too often, farmers are encouraged to grow a different crop, expecting higher levels of demand and better prices than their existing crops, only to find that too many other farmers have been encouraged to do the same or that cheaper imports have been allowed, leading to oversupply and much lower-than-expected prices.

Box 17
Case study. Securing supply chains, raising production standards and improving livelihoods

In 2002, Nestlé co-founded the Sustainable Agriculture Initiative Platform (www.saiplatform.org), which aims to foster sustainable agriculture practices worldwide. Nestlé sponsors a number of programmes in Africa, including working with smallholder farmers in Ethiopia to grow high-quality fair-trade coffee, diversify their crops, improve their communities and achieve a higher standard of living. With more than two thirds of the world's cocoa supplies sourced from West Africa, Nestlé has played a leading role in the region to help put in place a series of global partnerships to improve both labour standards in cocoa farming and living standards for farmers and their families. These include the sustainable tree crops programme, which improves cocoa production techniques and yields, and the international cocoa initiative, which is working to promote best practices and help sensitize communities towards child labour issues (see www.nestle.com/SharedValueCSR).

58. Rather than promoting overdependence on particular crops, which is unsustainable if prices collapse, efforts to improve the welfare and productivity of farmers should focus on the farmers themselves, improving their capacity, knowledge, practices and livelihoods, and helping them grow a diversified portfolio of crops.

Box 18
Case study. The Business Alliance Against Chronic Hunger

The Business Alliance Against Chronic Hunger was formed in 2006 by a group of chief executive officers and public leaders to reduce hunger in Africa by strengthening value chains through business development and market linkages. Globally, the Alliance promotes effective business models to reduce hunger, facilitates dialogue and engages in global partnerships with Governments, non-governmental organizations, international agencies and communities. In Siaya, the poorest district in Kenya, where 38 per cent of children are stunted by malnutrition, over 30 companies — including Sealed Air, General Mills, TNT and Technoserve — plus key partners — including non-governmental organizations such as the Millennium Development Goals Centre, international agencies and the Government of Kenya — are taking action in staple crop production and market linkages; integrated processing and packaging; retail and consumer market development; and entrepreneurial capacity-building (see www.weforum.org/en/initiatives/hunger/index.htm).

59. Land tenure is central to the sustainability challenge. Farmers have little or no incentive to invest in land stewardship if they do not have secure tenure. Land tenure across Africa takes many forms, but secure formal property rights are largely non-existent: in sub-Saharan Africa only 1 per cent of land is officially registered. The absence of formal titles to land means that farmers have no collateral against which to borrow. Faced with prohibitively high interest rates, they lack the capital needed up front to invest in their land or to grow new, more profitable crops.

60. Sustainable agriculture is not possible without adequate water supplies and irrigation. Barely 4 per cent of arable land in sub-Saharan Africa is irrigated (compared with some 39 per cent in India), exposing farmers to great risks from low rainfall. Farmers with insecure land tenure, limited access to capital and unreliable income streams have little incentive or capability to invest in better soil and water management practices and irrigation systems.

61. The most profitable crops typically require the most water inputs. Appropriate micro-irrigation systems such as micro-dams, catch and store technologies and drip feed irrigation schemes can be effectively managed by rural communities and do not cause the considerable environmental and social disruptions associated with large-scale irrigation projects. According to the International Water Management Institute, the gains to be made from such initiatives are large, but require a radically different approach to managing total rainfall.

A. Government commitment and support are fundamental

62. Many African Governments have made agriculture a national priority. The African Union Comprehensive Africa Agriculture Development Programme is finalizing its strategic framework.

63. Agri-business supports the conclusions of the African Union's Africa Fertilizer Summit held in June 2006, in Abuja, Nigeria. The Summit addressed Africa's food challenges, soil fertility crisis and the need for regional and national strategies, development plans and financing mechanisms in the agricultural sector, including questions of infrastructure, access to complementary inputs, and agro-dealer networks. In the Abuja Declaration on Fertilizer for the African Green Revolution, Heads of State and ministers resolved to increase the use of fertilizer from the current average of 8 kilogram per hectare to an average of at least 50 kilogram per hectare by 2015. Shorter-term goals for African Union member States included measures to reduce the cost of fertilizer procurement, especially through harmonization of policies and regulations to ensure duty- and tax-free movement across regions; to improve farmers' access to fertilizers; to address the particular needs of women farmers and to develop and strengthen the capacity of youth, farmers' associations, civil society organizations and the private sector to address fertilizer needs.[5]

64. The Conference of African Ministers of Finance, Planning and Economic Development in April 2007, in Addis Ababa, urged Governments to scale up public sector investments in infrastructure, agriculture, health and education, as the foundation for private sector-led growth to meet the Millennium Development Goals. The ministers resolved to launch the African Green Revolution by the end of 2008 by:

(a) Ensuring the access of smallholder farmers to fertilizer, improved seeds and targeted subsidies;

(b) Investing in water management;

(c) Strengthening agricultural extension services;

(d) Expanding rural infrastructure, especially roads and energy services;

(e) Promoting regional cooperation in intra-African trade and investment in agriculture.

65. Agriculture is crucial to the sustained growth of Africa's economies and to improving the lives of millions of poor people, especially since population growth still outstrips food production on that continent. Agriculture is an extremely heterogeneous sector, encompassing subsistence and smallholder farmers as well as cooperatives and large-scale plantations and other forms of production. In this regard, policies need to be flexible enough to enable the diverse business of agriculture to flourish at every level of the supply chain.

66. The challenges posed to agriculture by the changing geography and demographics in many African countries must not be underestimated, but they also provide opportunities, such as the new urban markets for agricultural products arising from rapid urbanization. Linking farmers to these markets through efficient value chains and enhanced competitiveness is important. The return of agriculture to the international development agenda is an important window of opportunity not to be missed.

[5] www.africafertilizersummit.org.